## Polymely in Xenopus laevis

In several genera of the order Anura supernumerary limbs occur naturally<sup>1</sup>. They are usually extra hind limbs<sup>2</sup>. Polymely does not appear to have been reported in the genus Xenopus. The female toad (Xenopus laevis) described here came with a consignment of toads imported from South Africa in 1956. The toad measured 8.0 cm. from snout to vent and weighed 60 gm. and, except for a supernumerary right arm, was quite normal in appearance. The additional forearm was a mirror image of the normal right arm and was the same size as the two normal limbs. It measured  $3 \cdot 2$  cm. from the axilla to the tip of the longest digit. The additional limb was attached immediately anterior to, and in the same plane as, the normal right arm. The point of attachment of the two limbs formed a prominent bony lump (Fig. 1). The extra limb was functionally normal and capable of independent movement. Xenopus is aglossate and pushes food into its mouth with both hands. In this specimen the back of the supernumerary hand assisted the normal left hand to carry food to the mouth, and the normal left hand alone was used for pushing food into the mouth. This toad had no difficulty in competing with normal Xenopus for food and was well nourished.

The toad had been in the laboratory for more than a year before its abnormality was noticed, and it was only discovered then because the toad was handled.



Fig. 1. Female Xenopus laevis with a supernumerary right arm



Fig. 2. The toad in the 'two-armed' position; supernumerary arm concealed

Fig. 2 shows the animal in the 'two-armed' position; the supernumerary limb is concealed by the head. When the toad rested in this position it was indistinguishable from normal animals in the same tank. Accounts of supernumerary limbs in the Anura show that the extra limb is abnormal, being incomplete osteologically and deficient in muscle. This was not the case for the toad described here. The extra limb was functional, and had the same dimensions as the two normal fore limbs. This example of polymelia in the genus *Xenopus* appears to be the first that has been reported, and supernumerary limbs have never been described in the related genera *Pipa*, *Hymenochirus* and *Pseudohymenochirus*. During 1947–57, we have imported 23,250 toads from South Africa, and in the same period 6,480 *Xenopus* have been bred in this Laboratory. No other toad has had a supernumerary limb.

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<sup>1</sup> Bateson, W., "Materials for the Study of Variation" (1894). <sup>2</sup> O'Donoghue, C. H., Zool. Anz., 35, 759 (1910).

## A New Type of Light Organ in the Deep-Sea Fish Opisthoproctus

In the closely related salmonoid genera Opisthoproctus and Monacoa the ventral surface is formed as a flat sole reaching from under the head to the terminal or subterminal anus. Trewavas<sup>1</sup> found an organ immediately under the skin of the sole which she regarded as a swim-bladder. The question why these fishes, in contrast to all other known bathypelagic fish, should have a flat ventral surface and presumably swim upside down called for an explanation.

Dissections and serial sections of specimens from the *Dana* Oceanographical Collections revealed the following facts :

1. Opisthoproctus has a swim-bladder in the normal position (Fig. 1, SW).

2. The organ in the ventral sole (Fig. 1, *REFL*) is not a swim-bladder. Its lumen is completely filled with a very transparent gelatinous tissue and no *retia mirabilia* or gas gland is present.

3. As described by Trewavas, the so-called swimbladder is posteriorly attached to a swelling of the rectum (Fig. 1, RE). The wall of this rectal bulb is strongly pigmented and contains numerous blood vessels. A sagittal section through the bulb shows that its posterior wall is covered inside by a thick luminous epithelium of similar appearance to that found in the light-organs of ceratioids. Like these, this light-organ is an open gland most probably containing luminous bacteria. In front of the



Fig. 1. Sketch of Opisthoproctus showing position of swim-bladder (SW), rectal light-organ (RE) and its reflector organ (REFL). Paired fins and gonad removed. (CL, cleithrum; KI, kidney; L, liver)